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Reliability-simulation of composite tubular structure by finites elements method–Mechanical loading

A.MAIZIA, A.HOCINE, H.DEHMOUS, D. CHAPELLE

Abstract : The diversified use of filamentary composites in harsh marine environments, recorded in recent years has prompted researchers to focus their work on the reliability prediction. Owing to differences between the properties of the materials used for the composite, the manufacturing processes, the load combinations and types of marine environment, the prediction of the reliability of composite materials has become a primary task. Through failure criteria, TSAI-WU and the maximum stress, the reliability of multilayer tubular structures under mechanical loading is the subject of this first part of our research project, where Monte Carlo method estimated the failure probability. A sensitivity analysis was performed in order to identify the influence of the deferent parameters as : materials properties, geometry, manufacturing and loading, on the reliability of the composite cylindrical structure studied. To achieve a high accuracy of the results, we have carried out 10 simulations. The results showed great influence of radius ratio (Ply thickness); than internal pressure loading and finally winding angle.

Keywords : Multilayer Tubular Structures, Marine structure, Design, Reliability, Monte Carlo.